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UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 301

Contribution from the Bureau of Biological Survey
HENRY W. HENSHAW, Chief

Washington, D. C. ▼ October 29, 1915

SILVER FOX FARMING IN EASTERN NORTH AMERICA

By

NED DEARBORN, Assistant Biologist

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INTRODUCTION.

Furs are the most useful and valuable of the several products derived from wild animals. Indispensable to primitive man, they are scarcely less important to the civilized, for in warmth, beauty, and durability no manufactured fabrics equal them. As the result of increase of population and of encroachments upon the breeding grounds of the fur bearers the supply of furs has steadily diminished and prices have correspondingly advanced. Trappers have been stimulated to penetrate farther and farther into the uninhabited regions of the north and to redouble their efforts to increase their catch nearer home. Many of the more valuable animals are now so scarce that the demand for their pelts is met by the substitution of inferior products. Among the most important of the fur bearers of North America is the silver fox, which furnishes the subject of this bulletin.

The natural production of first-class furs seems to be approaching a sure end, and the growing and world-wide demand for them requires that the present supply be supplemented with stock obtained through domestication. Experience has demonstrated that some of the fur bearers may be raised without much difficulty. This is likely to lead

to the establishment of fur farming on a small scale as an additional source of income on farms in many places along our northern border, much as poultry is now raised. When properly conducted, fur farming may become very profitable. It will pay not only in direct returns to the producer but, indirectly, the natural and legitimate desire for furs can be gratified, the extirpation of the most valuable and interesting of our fur bearers can be prevented, and an extensive department of manufacture and trade supporting a large population can be continued.

Success in domesticating wild animals, as in other branches of husbandry, depends on experience, adaptability, and prudence. No one should engage in the business unless he enjoys it and is familiar with the habits, characteristics, and climatic requirements of the animals he intends to propagate. The choice of location is of prime importance. The best furs come from cool, moderately humid regions. If a locality furnishes native furs of high grade, that locality is favorable to the domestication of fur bearers. The climate of the Middle and Southern States is not well suited to this industry, as shown by the medium or low prices commanded by furs from these areas. The ratio of expense to income must be considered with care. One can not pay the exorbitant prices animals for stocking purposes sometimes bring and expect to raise fur at a profit. Neither can one expect to raise furs of a fine quality from inferior stock. But given a normal market for breeding-stock and pelts, a favorable location, a love for animals, and an ordinary degree of prudence, one may engage in black or silver fox farming with a good prospect of satisfactory returns, provided, of course, a high price for pelts is sustained. Values of animals and pelts were very high a few years ago, when the industry was being launched, but are now on a much lower basis. Persons who contemplate going actively into the business or investing their money in corporations or companies organized for fox farming should thoroughly investigate it in all its phases.

THE SILVER FOX.

The name "silver fox," as commonly used by furriers, includes the dark phases of the ordinary red fox,[1] variously called silver, silver gray, silver black, or black. It should not be confused with the gray, or tree, fox[2] of the United States, the fur of which is of comparatively little value. The color of the red fox of the Northeastern States and of its allies of the colder parts of North America varies from red to black, and these extremes, with their gradations, form four more or less distinct phases, known respectively as red, cross (or patch), silver, and black. In the red phase the fur is entirely

[1] Genus *Vulpes*. [2] Genus *Urocyon*.

rich fulvous, except for restricted black markings on the feet and ears, a white area at the end of the tail, and certain white-tipped hairs on the back and rump. Grading into the next phase the black increases in extent until, in the typical cross fox, the black predominates on the feet, legs, and underparts, while fulvous overlaying black covers most of the head, shoulders, and back. A gradual increase of the black and elimination of the fulvous, or its replacement by white, results in the next phase, the silver (or silver gray) fox (fig. 1), in which the entire pelage is dark at the base and heavily or lightly overlaid with grayish white. The color of silver foxes varies from grizzly to pure black, except for a few white-tipped hairs on the back

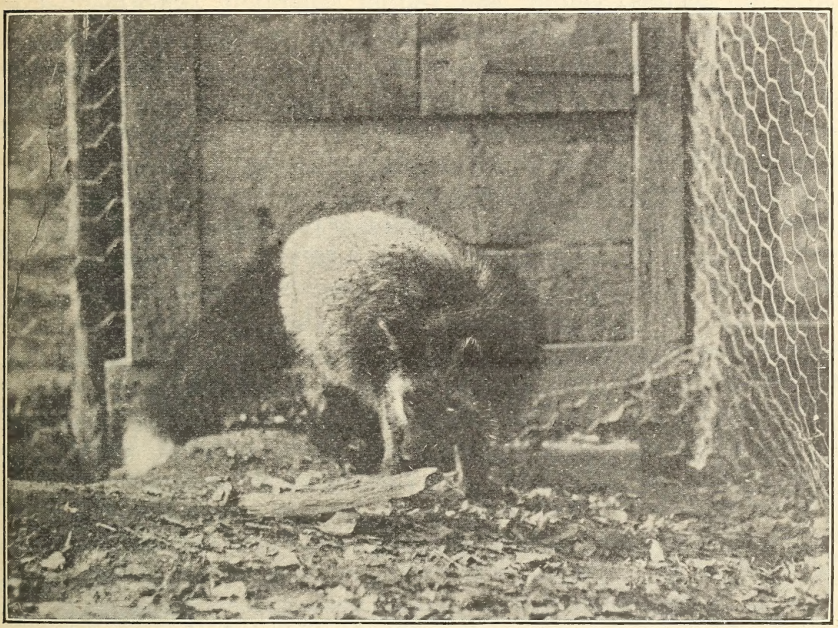

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FIG. 1.—A silver fox.

and rump. Finally, in the black phase, the white is absent from all parts except the tip of the tail, which is white in all four phases. The red phase is much more abundant than the others, but all four interbreed freely, and wherever one occurs occasional examples of the others may be expected. In general the cross fox is fairly common, the silver gray scarce, and the pure black very rare.

The market value of skins of the different phases depends upon the relative scarcity of the animals. The price paid for black skins, however, has recently fallen considerably below that of silvers, for the reason that furriers now dye ordinary red fox skins a lustrous black, and put them on the market at a comparatively low figure.

HISTORY OF DOMESTICATION.

Domestication of the fox was first achieved in 1894 by Robert T. Oulton and Charles Dalton on Prince Edward Island, a Canadian Province in the Gulf of St. Lawrence. Silver fox pelts have continuously commanded high prices, and hunters have been correspondingly keen to secure them. It is not strange, therefore, that the first successful breeders of this rare animal were men who had pursued it in the chase. The two mentioned had hunted foxes together and had frequently bought and sold fox pelts of their neighbors. Oulton was once lucky enough to shoot a silver fox the skin of which netted $138. Becoming impressed with the possibility of domesticating such valuable fur bearers, Oulton and Dalton separately experimented in building fox-proof fences and in feeding and breeding the animals. After several years' work on these problems they formed a partnership in 1894, built a ranch, and stocked it with two pairs of silver foxes. This became the first profitable fox ranch, the forerunner of a remarkable and, for that region, a revolutionizing industry.

At that time black pelts brought much higher prices than silver pelts. This prompted Oulton & Dalton to retain their darker animals and dispose of the lighter ones, and as a result each successive lot of pelts from their yards was darker than those of previous years. Finally, in 1910, they were able to send to the London sales the finest collection of silver fox pelts that had ever appeared there. This lot, containing 25 pelts, brought an average of $1,386 each, the best one selling for $2,624. In the meantime a few other small ranches had been started in the Maritime Provinces, Newfoundland, Maine, Ontario, Michigan, and Alaska. The policy of the half dozen Prince Edward Islanders in that business had been to monopolize it. They had kept their own counsel, and not even their families were enlightened as to methods. The pelts had been shipped three in a package by parcel post from a distant post office, and reports of the sales had been received in code. The fox raisers had entered into a compact to sell no live silver foxes and had bought the best that could be obtained. Notwithstanding their secrecy, the evident improvement in their financial conditions was noticed by their neighbors, who thereupon desired to participate.

Disclosure of the results of the 1910 sales was the climax of the first stage in the development of fox farming. People who formerly had known something of the business were now eager to engage in it. Those having money invested it in foxes. Others mortgaged their farms for the purpose or fitted up ranching facilities and boarded foxes for a share of the progeny. How rapidly prices for breeding stock advanced is well illustrated by the experience of one ranchman who sold his first pair of cubs for $750, and other pairs successively for $3,000, $12,000, $13,000, and $14,000. In the fall of 1913 good ranch-bred cubs 6 months old sold for from $11,000 to $15,000 a

pair. Pairs that had had large litters were valued at about twice as much as 6-months-old cubs.

The maintenance of this prodigious inflation of prices was due mainly to stock companies, which originally were formed by individuals without sufficient capital to engage in fox farming alone. Almost immediately, however, companies were formed for the benefit of those having foxes to sell. It was customary for a company to take them over. An attractive prospectus containing pictures of silver foxes, an account of the 1910 sale of pelts, and a list of companies which had paid dividends of 20 to 500 per cent was published, and the stock sold through brokers and solicitors. Foxes that would bring $12,000 or $15,000 a pair in the open market were usually capitalized in companies at $18,000 or $20,000, which, after allowing for commissions, installation of pens, and other ranch necessities, left a tolerably safe balance from which to pay the first year's running expenses. Another reason for the multiplication of fox companies is found in the income to be derived from them by brokers and promoters, and many companies were formed by men having no other interest. The outbreak of the European war, in the summer of 1914, interrupted and probably ended these speculative operations. Ranch-bred silver foxes have recently been advertised for sale at from $1,500 to $2,000 a pair. In some of the western Provinces and Territories of Canada, where only those foxes born or kept for a year or more in captivity are allowed to be exported, prices of wild half-grown silvers run from $150 to $250 each. Prior to the war a general stagnation in the fur trade was beginning to have a depressing influence on prices of live foxes. The June, 1914, sale of silver fox skins in London averaged only about $118 each. From present indications values of foxes and of pelts are likely soon to fall as low as they were before 1910.

In the pioneer days, when proper methods of handling foxes were unknown, many failures resulted from ignorance and carelessness. The excitement following the fur sales of 1910 hastened the improvement of methods of feeding, handling, and breeding. It also broke the monopoly, and caused a rapid distribution of foxes and of information concerning them. Now, with a comparatively large number of silver foxes in domestication, with a clearer understanding of their successful management, and with a return of moderate prices for breeders, a steady, healthy, and general development of silver fox farming may be expected.

Fox ranches are established in most of the Canadian Provinces and in Maine, New Hampshire, Massachusetts, New York, Pennsylvania, Ohio, Wisconsin, Michigan, Minnesota, Missouri, Oregon, Washington, and Alaska. In 1913 there were 277 fox ranches on Prince Edward Island alone. There foxes have the same status as other domestic animals in being subject to taxation; this in 1913 yielded the Province a revenue of $37,172. In a recent report written from

Charlottetown by Consul Livingston T. Mays the number of domestic silver foxes on Prince Edward Island in April, 1914, was given as about 1,600, and in the following December as about 2,600, the increase for the year being approximately 66 per cent, or considerably below the average increase of former years. The value of the foxes on this island at the close of 1913, as estimated by the Commissioner of Agriculture, was over $15,000,000. A report of the provincial secretary, issued May 7, 1914, shows that there had been incorporated in the Province up to that time 196 fur-farming companies, nearly all of which were devoted to fox raising, carrying an authorized capitalization of $24,305,700. In December, 1914, the United States consul on Prince Edward Island reported that the capitalization had reached $31,500,000. From the foregoing it is evident that anyone contemplating an investment in fox farming, either directly or in the stock of an organized company, should first carefully consider all values in their relation to the actual returns possible from the average increase of the breeding stock. As pointed out elsewhere in this bulletin, prices of both live silver foxes and fox pelts are now far below prices paid a few years ago. The business of fox breeding will be on a much more stable basis than at present when the value of breeding animals bears an approximate relation to the value of their pelts in the open market.

AREA SUITED FOR FOX FARMING.

The natural habitat of red, cross, and silver foxes includes the greater part of North America, from central United States northward to and including the border of the treeless tundras. The red phase inhabits nearly all this region, but the silver phase, although known from most parts of it, is very irregularly distributed. In general it is much more common in northern localities than in southern, but many parts of the north where red foxes are abundant produce silvers only rarely. According to reports of wholesale fur buyers, many silver fox skins of high quality are secured from Newfoundland, the height of land between Quebec and the peninsula of Labrador, and from the upper Yukon in Yukon Territory and the adjacent region of east-central Alaska.

While pelts of all fur-bearing animals are more valuable when produced in northern localities, furriers have learned that certain localities are not too far south to produce valuable furs, but the conclusions they are able to form are of only very general application. The ordinary individual, however, is seldom able to profit by the experience of furriers; and, especially if he lives in a region in which fur-bearing animals have been exterminated, he can not judge whether his own locality is favorably situated for producing foxes with valuable pelts. Fortunately, in a general way a guide to such matters is furnished by maps of life zones of the United States. These zones are transcontinental belts, throughout which the animal

and plant life have a certain uniformity. To determine the regions suitable for fox farming, therefore, it is necessary to learn the areas within which foxes are known to produce superior fur. Records of

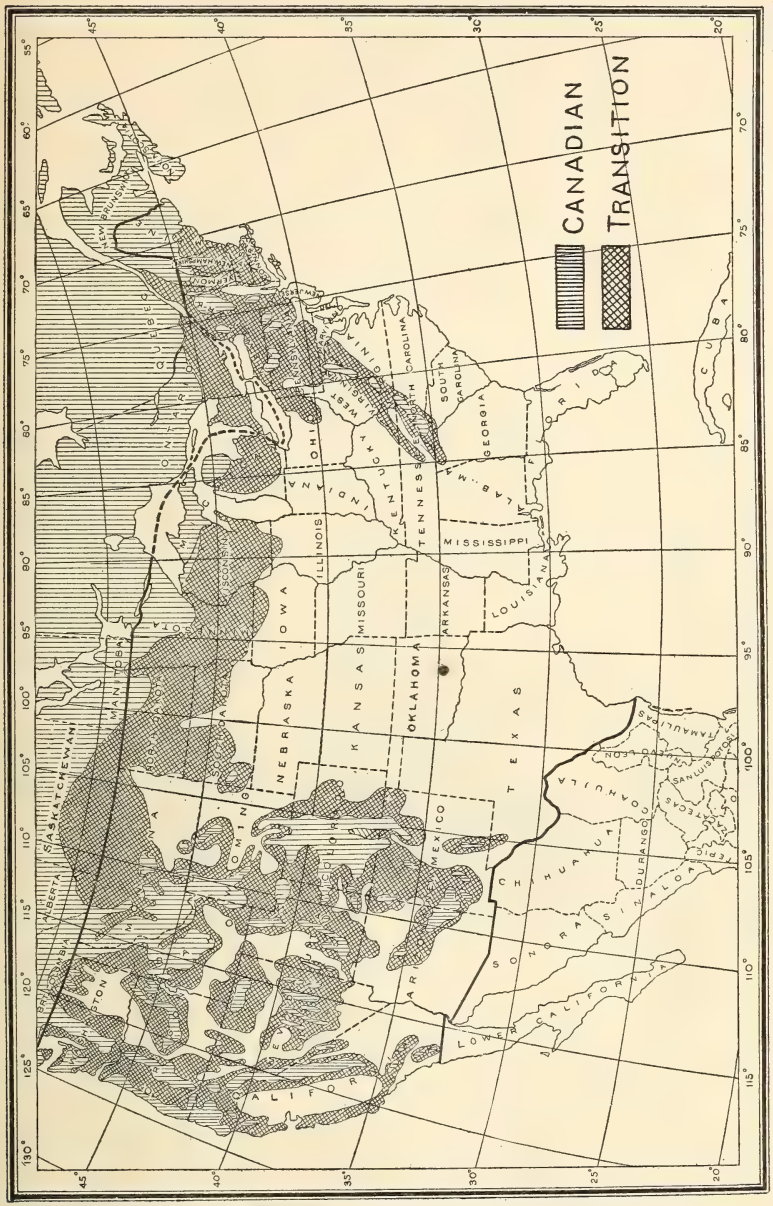

FIG. 2.—Map of life zones in which fox farming is feasible in the United States, showing the Canadian Zone, where conditions are excellent, and the Transition Zone, in parts of which conditions are favorable.

the Biological Survey show that such localities occur only north of the southern boundary of the Canadian Zone. This boundary, as shown on the accompanying map (fig. 2), crosses the States of Maine, New Hampshire, Vermont, Michigan, Wisconsin, Minnesota, and

North Dakota, and extends southward along the mountains in New York, Pennsylvania, West Virginia, and in all the States of the Rocky Mountain region and westward. South of the forested regions of the northern tier of States and western Oregon, however, the Canadian Zone, although sufficiently cold, is too dry and sunny for the production of first-class fur. In the Transition Zone, foxes having a fair quality of fur may be raised, but the best are obtained only in more northern latitudes.

RANCH SITES.

One of the most important conditions affecting the choice of site for a fox ranch is security from unusual noises and occurrences. Not that the animals must be kept where they can neither see nor hear the doings of civilization; but these must not be irregular or obtrusive, and every precaution should be taken to prevent unusual disturbances. The fox is naturally timid and nervous. It can be tamed to a degree, but its excitable temperament can be completely overcome only by a long process of careful breeding and selection. It is especially shy and irritable during the breeding season.

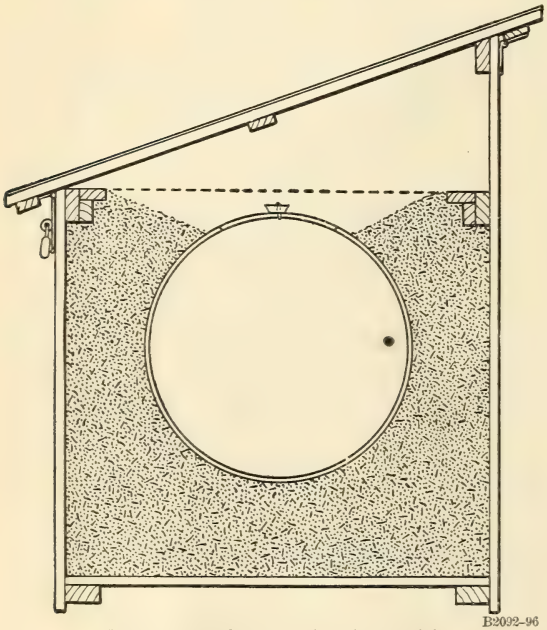

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FIG. 3.—Vertical cross section of a barrel den.

Foxes like to be screened from observation, and by day in the wild state are rarely found far from cover. During the heat of summer, especially, they enjoy dense shade. Furthermore, sunshine is deleterious to the color and character of fur. It is advisable, therefore, to locate a ranch among a growth of young trees thick enough to shade about half of the ground. Deciduous trees are preferable to evergreens, as they allow the sun to make the yards more comfortable in winter and to clear the ground of snow earlier in spring. Old trees are likely to be broken by storms, and in falling to demolish fences.

On a slope with a southern exposure the snow will be gone and the ground warm when the cubs are ready to leave the dens. A clay

surface is to be avoided, but a subsoil of clay or hardpan is an advantage, as foxes will not dig ground hard enough to require a pick to break it up. Gravel affords excellent drainage, but foxes burrow deeply in it and thus are difficult to manage, even though they may not escape.

INCLOSURES.

A model fox ranch has three kinds of inclosures: Dens, where the animals are sheltered and in which the young are born; yards or runs, where they may have sunshine and shade and sufficient exercise to keep them in good health; and a guard fence surrounding the entire ranch, for the double purpose of preventing intrusion from without and escape from within.

DENS.

The walls of a fox den should exclude moisture, deaden sounds, and protect the occupants from extremes of heat and cold. During the

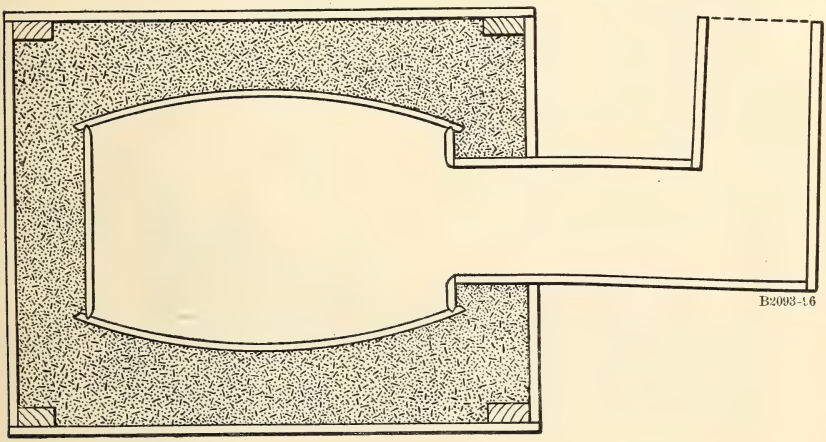

FIG. 4.—Horizontal longitudinal section of barrel den.

breeding season, when foxes are unusually nervous, and when the cubs can not withstand exposure, these features are particularly important. Provision should also be made for ventilation without admitting light or drafts. The barrel den shown in figures 3 to 6 is merely a clean barrel, having a smooth interior, surrounded by dry sawdust, within a wooden box. In one head of the barrel is an entrance hole 8 inches wide and 10 inches high. A similar opening is made in the upper side for inspection, cleaning, and ventilating. Above the barrel a screen door is hinged to preclude escape when the cover is raised. A sheet of burlap tacked to one side of the screen-door frame and spread over the netting when the covers are raised for ventilation will keep out air currents and light. At the entrance hole is an elbowed spout, 2½ feet in the shorter arm and 6 feet in the longer.

The large den shown in figures 7 to 9 has advantages not found in barrel dens. It has double walls, the interspaces being lined with building paper and filled with sawdust. The exterior may be battened, shingled, or covered with tarred paper. It is large enough to give the foxes lounging room outside the nest compartment, and is arranged so as to be easily cleaned and disinfected. By leaving the door open on fine days, the interior can be exposed to the drying and purifying effects of sunshine. The door and the opening to the exit chute should face southward, and the rear end should be raised enough to give the floor a slant downward toward the door. The

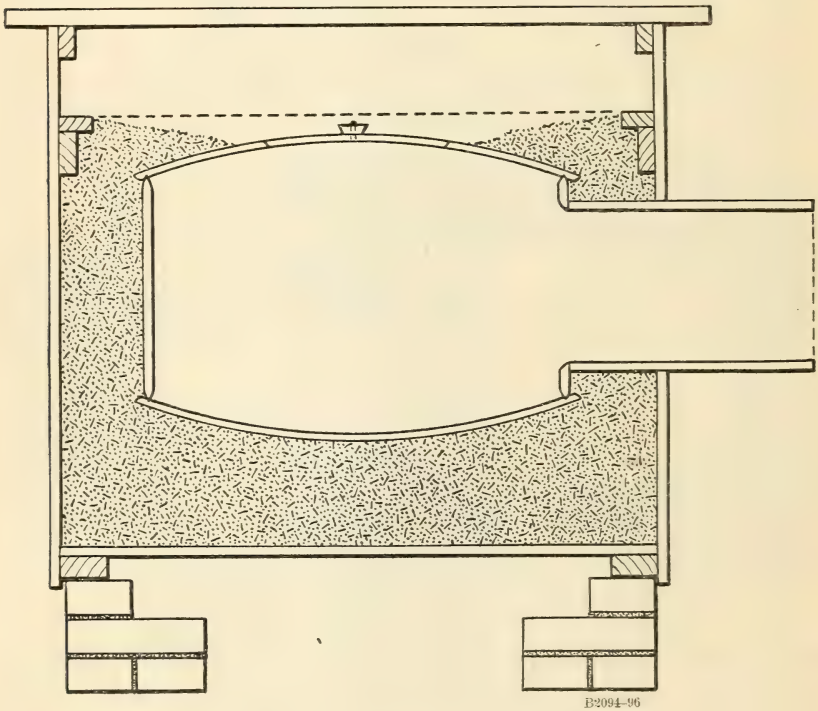

FIG. 5.—Vertical longitudinal section of barrel den.

entrance to the nest compartment and the inner end of the chute should be about 4 inches above the floor to prevent the cubs' getting out before they are able to return.

The corners around the floor of the nest compartment are filled with a chamfered strip of board (figs. 7 and 8) to keep very young cubs in contact with the vixen and thus prevent their becoming chilled. To accommodate a large family of cubs running about the yard, it is advisable to have extra dens improvised from barrels or boxes, as shown in figures 10 and 11. Such shelters increase the diversity of the yard, and afford the animals a choice when seeking protection from the weather. As to the proper location of a den, opinions differ.

Some place it near the middle of the yard, where the foxes are supposed to feel more secure. Others locate it outside the yard, in order that the vixen may not jump to and from the roof and thus cause abortion. All dens placed outside of yards should have an inner door of wire netting if they open to an alley.

YARDS.

Although fox yards vary in size, shape, and construction, depending on conditions on different ranches, there is a definite type now generally recognized as best adapted to fox farming. Such a yard has an area of from 2,000 to 2,500 square feet. The majority in the recently built ranches are 50 feet square. Some breeders prefer long, narrow yards, which give the foxes more space for a hard run when they are frolicsome, though the cost of fence materials is considerably greater than for square yards of the same area. The arrangement of a series of yards depends upon the space they are to occupy. When arranged as nearly as possible in the form of a square the expense of inclosing by a guard fence is less than when side by side in a row. Two plans of four-yard ranches are shown in figures 13 and 14, the smaller compartments being for males. The expense for posts and scantlings in building a ranch on the plan of figure 13 is less than for the plan of figure 14, inasmuch as adjacent yards have a common frame between them. But the extra cost of building detached pens as shown in figure 14 is more than compensated for by the greater convenience in caring for the animals and in controlling them in case they escape from their yards. If a fox gets out of its yard, it is sure to be discovered in one of the alleys, whence its return to its proper quarters is a simple matter.

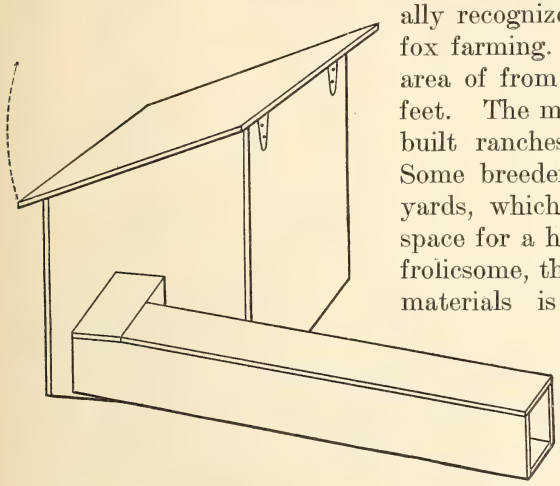

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FIG. 6.—Exterior view of a barrel den (see figs. 3–5).

The supports of a fence are ordinary wooden posts set in the ground at intervals of from 12 to 16 feet. The heaving effect of frost, however, has caused many fox owners to abandon them for a framework of scantlings entirely above ground. The foundation may be of stone, concrete, or creosoted planks. The posts of framed fences are tied together by the netting and braced from the ground as shown in figure 15. A durable and attractive fence support

recently adopted by several fox owners is shown in figure 16. It has a concrete foundation 4 feet deep, 9 inches thick at the bottom, and 6 inches thick at the top, and projects slightly aboveground. In this are embedded posts of 1-inch galvanized-iron pipe. Tie-rails of ¾-inch pipe connect these posts at the top and also just above the foundation.

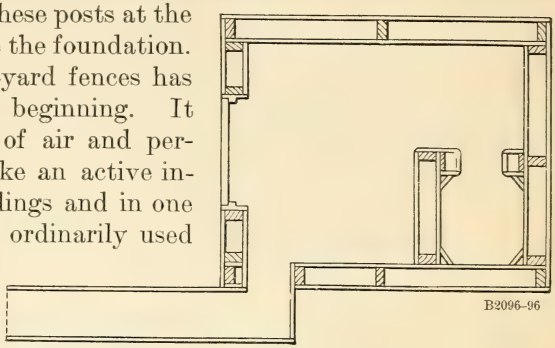

FIG. 7.—Ground plan of a double-walled den.

Wire netting for fox-yard fences has been in use from the beginning. It allows free circulation of air and permits the animals to take an active interest in their surroundings and in one another. The netting ordinarily used is like that for poultry runs, except that the wire is heavier. It may be of 2-inch mesh in 14, 15, and 16 gauge. The lower part of a fence should be made of the heaviest wire obtainable, the lighter grades being used for the middle and upper parts. As very young foxes are likely to become entangled in 2-inch netting or even to go through it, many fox breeders use only 1½-inch mesh. Those having 2-inch mesh usually reinforce it from 6 inches above the surface of the ground to 6 inches below it with boards or a strip of 1-inch netting.

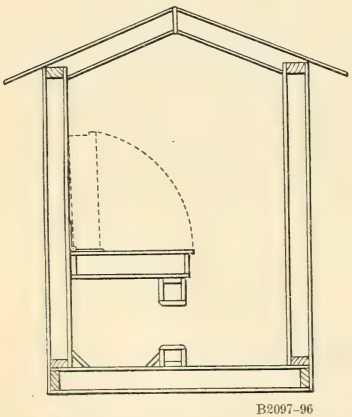

FIG. 8.—Vertical cross section of double-walled den.

The disposition of foxes to take an adversary at a disadvantage has led to serious injuries when adjoining yards were separated by only a single partition of coarse netting. In a number of instances a climbing animal has had its foot seized, pulled through the fence, and held by the occupant of the next yard until its frantic struggles to escape resulted in a badly mangled leg. Such accidents can be avoided by making double-walled partitions, the walls separated by at least 4 inches, or single-walled partitions of 1-inch netting or of boards. The necessity of erecting double partitions is overcome, however, by use of the plan illustrated in figure 14.

The height of a fence depends somewhat upon the depth of the snowfall. In Maine and the Maritime Provinces the usual height is 9 or 10 feet, while in Labrador it is 12 feet. To prevent foxes from

digging out, the fence is either extended into the ground (fig. 17) or turned abruptly inward at the surface (fig. 18) to form a mat 3 feet wide, the inner edge of which is pinned firmly to the ground and usually covered with earth or stone. A fence extended into the ground must reach a depth of 4 or 5 feet if the soil is soft, and be turned inward a foot at the bottom. If there is a subsoil of clay or hardpan, the fence need not enter it more than 6 inches. Instead of netting, the underground part of a fence may be made of 2-inch creosoted planks. As foxes climb wire fences readily an inward overhang about 18 inches wide should be placed at the top to prevent escape (figs. 15–20). When a fox has scrambled up to an overhang, its only means of descending is by falling.

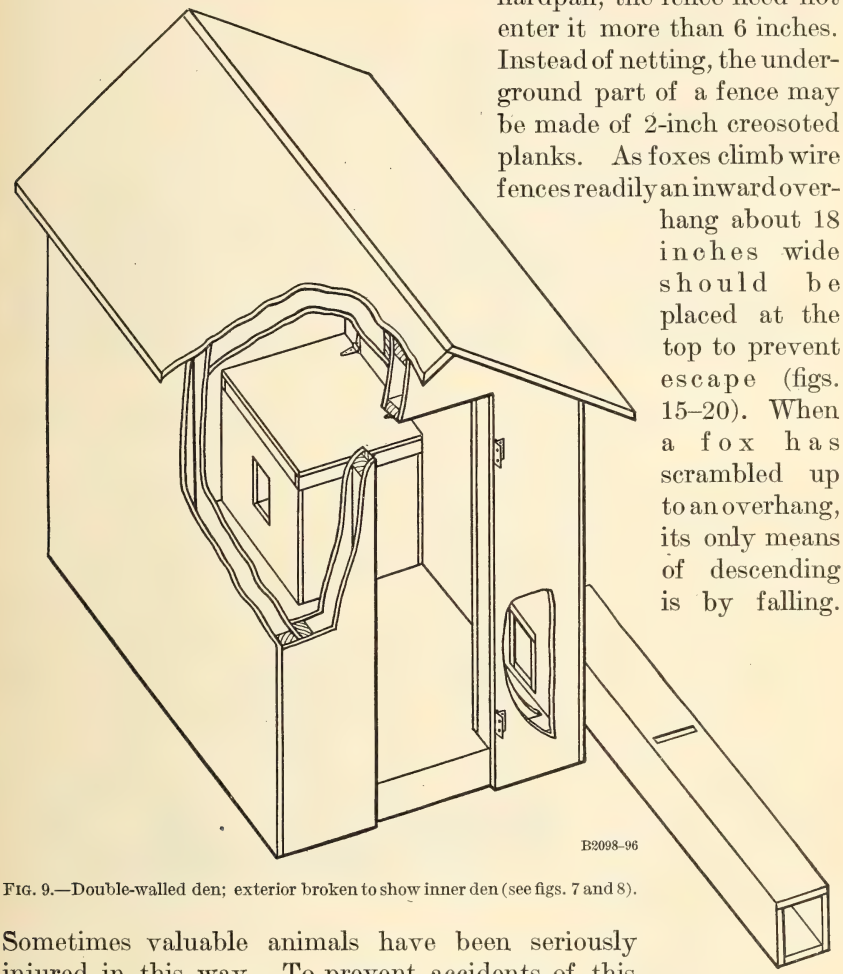

FIG. 9.—Double-walled den; exterior broken to show inner den (see figs. 7 and 8).

Sometimes valuable animals have been seriously injured in this way. To prevent accidents of this kind an intermediate overhang is sometimes constructed 5 feet from the ground, as shown in figure 16, or a smooth zone of boards or sheet iron is inserted in the upper half of the fence, as shown in figure 20.

The yards for sequestering males are usually adjacent to the main yards, with which they are connected by a chute having a sliding door (fig. 21), though sometimes they are separated from the family

yards. It is advisable to have them roomy, as indicated in figures 13 and 14, in order to give the animals enough runway to make them vigorous during exile. When allowed to be together the pair may have the run of both yards. Although quarters for constant occupancy should be roomy, those for temporary use, such as are required by dealers and by ranchmen for isolating sick or newly arrived animals, may be comparatively small. Temporary pens are often not more than 6 by 10 feet on the ground and 4 or 5 feet high. They are made with netting on top, bottom, and sides, stretched over a frame of scantlings. The posts do not enter the ground, but rest upon sills, to which they are securely nailed. By means of braces the frame can be made rigid, and when covered with netting is strong enough to be moved without weakening. The cheapness, security, and portability of these pens make them a very useful adjunct. Foxes have bred and reared young in temporary pens that were only 12 by 15 feet, but such narrow quarters are not recommended for permanent use.

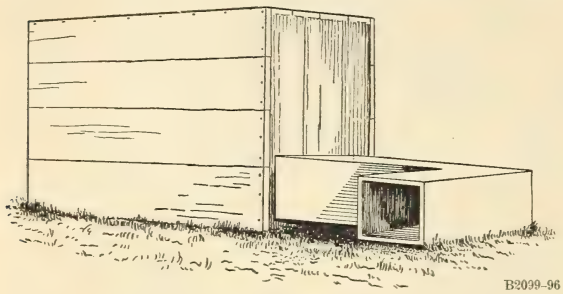

FIG. 10.—Den improvised from a box.

When alleys are used between pens, as shown in figure 14, it is well to have them closed at the outer ends to facilitate the return of escaped animals and provided with overhangs. Entrance to the yards should be by way of these alleys.

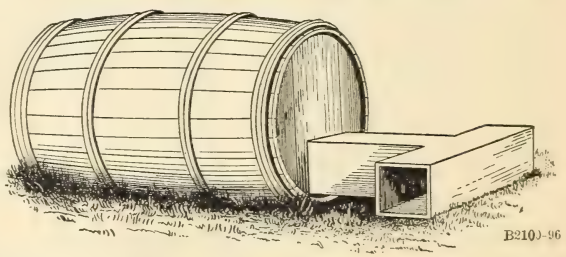

FIG. 11.—Den improvised from a barrel.

Doors may be made entirely of wood, or of netting attached to a durable frame which can not be gnawed by a fox or warped (fig. 19). If they are divided into upper and lower sections of equal size, much of the labor of clearing paths when snow is deep can be eliminated by leaving the lower half of each door closed.

GUARD FENCES.

The guard fence surrounding a fox ranch is generally constructed like the yard fences already described. Where snow drifts badly, the fence should be built of boards rather than netting, in order to keep the snow from piling up in the yards. In addition to the usual

inward overhang it should have an outward overhang of barbed wire to keep out dogs and other intruders (fig. 15).

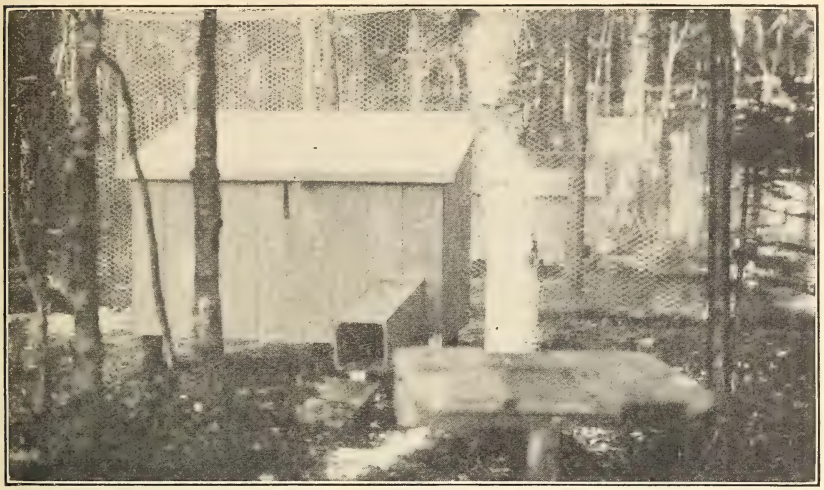

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FIG. 12.—An inexpensive type of den. Table in foreground is for the food of parent foxes; by means of it young cubs are prevented from obtaining too much meat.

FOOD.

Wild foxes eat a wide variety of food, including mice, rabbits, birds, insects, and wild fruits. When grasshoppers are present large quanities are eaten. Meat, therefore, is only a part of their natural diet. Indeed, foxes, like dogs, are almost omnivorous, and there is less danger in feeding any particular kind of food than in feeding too large quantities at irregular intervals.

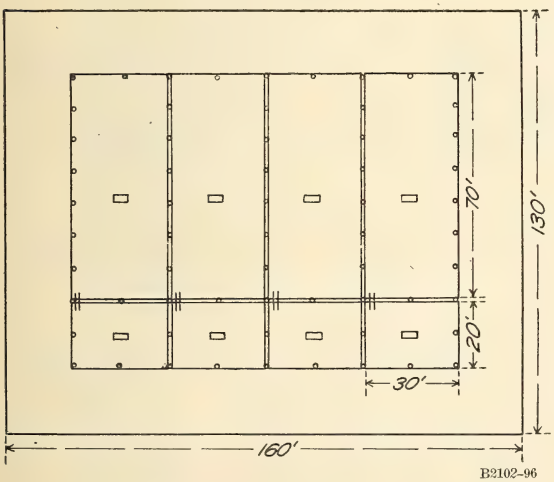

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FIG. 13.—Plan for rectangular yards in series; dens within yards.

The rations of domesticated foxes include beef, horse meat, mutton, veal, woodchucks, rabbits, liver, fish, eggs, milk, bread, mashed potatoes, crackers, mush, dog biscuits, and soft fruits. The selection of meats is largely a matter of circumstances. At irregular and uncertain intervals one may obtain injured or worn-out but otherwise

healthy horses, old sheep that can not be fattened for mutton, all of which, when slaughtered, make good and cheap meat. Wherever available, whale meat is used extensively. Woodchucks and rabbits, freshly killed, are always welcome in a fox yard. When cheap meats fail, beef and poultry are used.

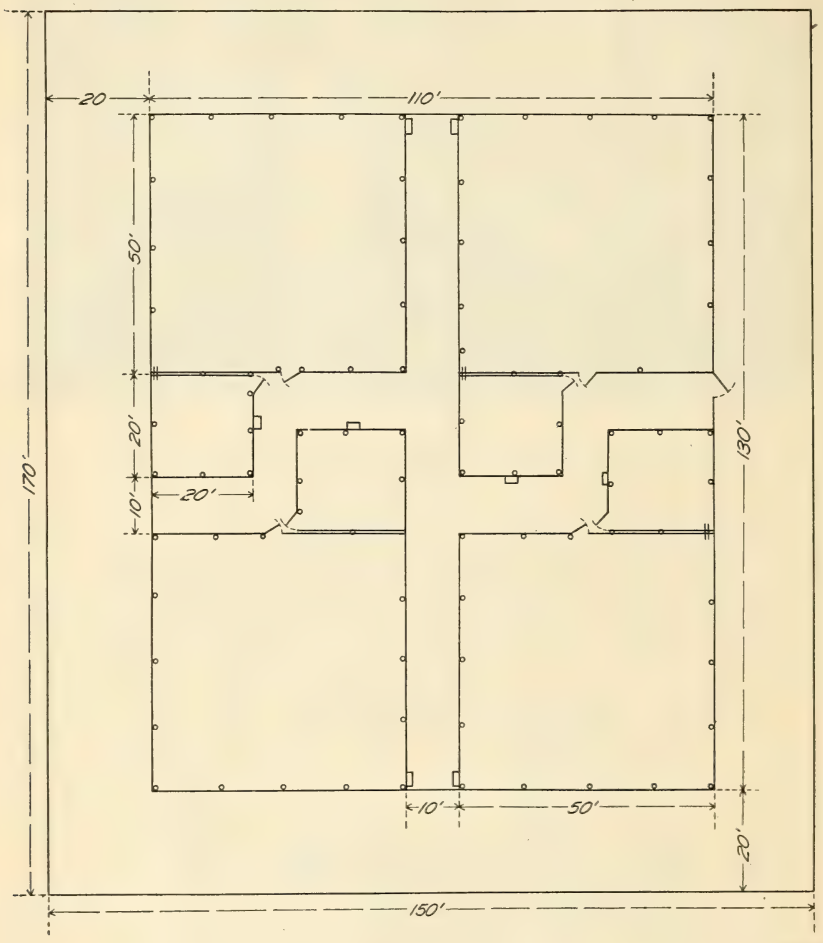

FIG. 14.—Plan for square detached yards; dens and doors in alleys. B2103-96

Fortunately, foxes do not need meat every day. Some keepers feed it but two or three times a week. Young foxes are not allowed meat until they are four months old, as it is likely to cause rickets. Milk, with some sort of bread or cooked mush, is the standard food for old and young. Foxes which are fed twice a day usually have meat in the morning and bread or mush and milk at night. In summer the proportion of meat is less than in winter. When smelts or trout can be had they are frequently substituted, but fish is not considered

good for foxes in warm weather. Coarser fishes are sometimes used, but are not very much in favor. It is not deemed well to feed milk and fish on the same day. Milk and eggs are often given to females about the time cubs are expected, to strenghten them, relax their bowels, and allay fever. Fish, liver, and tripe are other laxative foods which may be used instead of milk and eggs. A diet of eggs, milk, mush, and wheat bread without leaven or salt is excellent.

The preparation of food for foxes deserves careful attention. All dishes should be kept clean. Meat that is diseased, tainted, or infected with parasites must be boiled. It is better to skin rabbits, as their hair readily felts and sometimes forms in balls in the stomachs of animals which feed on them. Their heads and entrails also should be removed, as these parts are frequently infested with parasites. Smelts and small trout may be fed whole, but larger fish should be dressed and the backbones removed. Chilled meat should be warmed before being offered to cubs or nursing females. Oatmeal or cornmeal mush should be thoroughly cooked. All food for sick animals should be cooked to make it more digestible and to free it from disease germs.

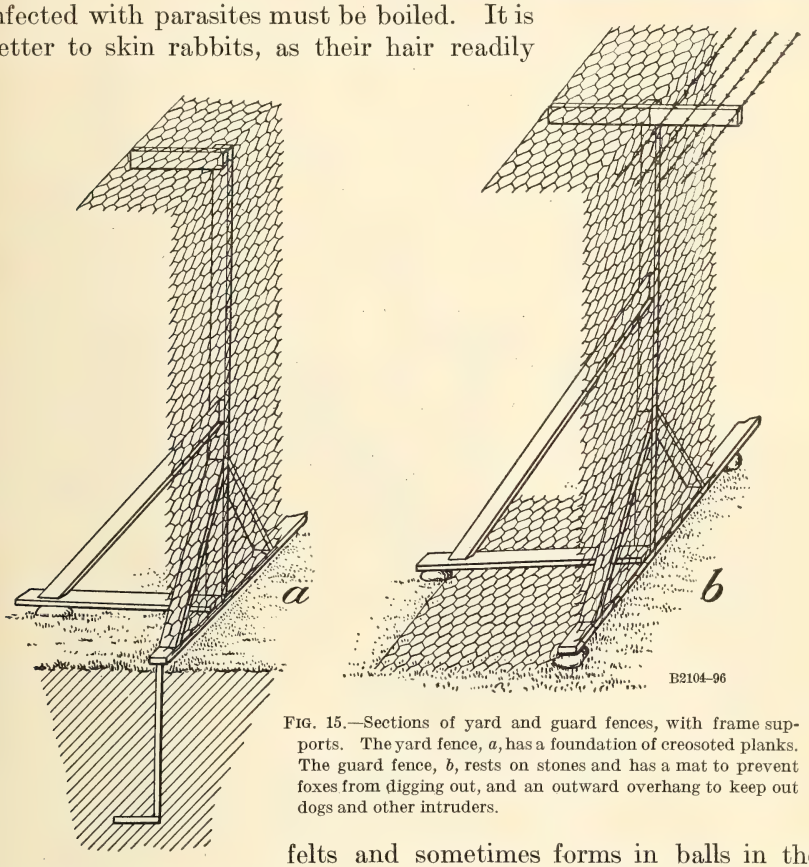

FIG. 15.—Sections of yard and guard fences, with frame supports. The yard fence, *a*, has a foundation of creosoted planks. The guard fence, *b*, rests on stones and has a mat to prevent foxes from digging out, and an outward overhang to keep out dogs and other intruders.

Foxes should be fed regularly twice a day, morning and evening. This is especially important in hot weather, as whatever is left from the first meal will spoil before time for the next. By giving at each feeding only the proper quantity, the injurious effects of gorging can be avoided. Overfeeding is more dangerous than underfeeding. Fat animals are not prolific breeders. Eight or ten ounces of meat is sufficient for one meal.

BREEDING.

Foxes breed only once a year, the mating season occurring in February or March, and lasting anywhere from a few hours to two or three days; it is often indicated by a brownish discharge. The period of gestation is about 51 days, the young being born in April or May. The number of young in a litter varies from two to eight, the average number born to adult parents being four. In the wild state foxes are monogamous, and while the young are being reared the male dutifully forages for them. In captivity, however, one male sometimes has been mated successfully with two or even three females. In certain cases this may be desirable, but very often it results in no increase whatever. Breeders generally prefer to keep their foxes in pairs.

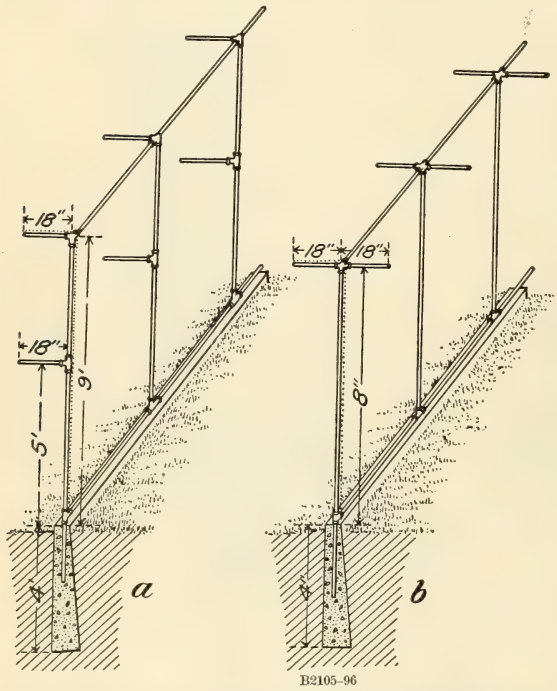

FIG. 16.—Iron posts and concrete foundations for yard fence, *a*, and guard fence, *b*. Note the 18-inch overhangs, two on the yard fence, one of which (5 feet from the gound) is to prevent foxes from climbing to the top and the resulting injury from the greater fall.

Males are removed from the breeding yards for a part of each year, the length of their exile depending upon the relations of the pair. If they are quarrelsome, it is best to separate them soon after the female becomes pregnant. If, on the contrary, they agree and show attachment to each other, it is wise to keep them together until the cubs are four weeks old, but after that the male is likely to bite them during scrambles for food at meal times. While the vixen is devoting

herself to the young, the male carries food to her and warns her by sharp barks whenever he suspects danger. While sequestered, the males are usually kept in small pens which may adjoin the breeding yards, as shown in figures 13 and 14, or removed to a separate inclosure, where they may be allowed to run together in a large yard or confined in individual pens. Because of their inclination to fight, individual pens are preferable.

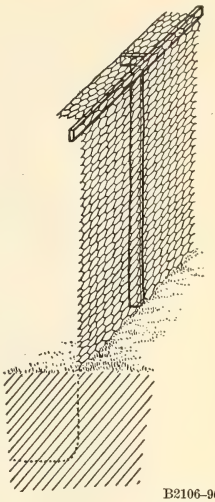

FIG. 17.—Fence extending into the ground.

The reproductive period in foxes is about 10 years. Approximately 50 per cent of the females in domestication breed each year, and the aggregate increase is not far from 100 per cent for the total stock on ranches. Failure to breed is attributable to a variety of causes, among which are sterility, injuries, worry, and mismating. Females barren for two years in succession frequently become productive on being mated to a different male. Prolific vixens, run down by several litters in succession, sometimes skip a year in which to recuperate. Foxes breed more freely on the ranch where they were reared than amid strange surroundings. Their wild nature dominates most of their actions. They are constantly in a state of apprehension, and it is only by the greatest care that confidential relations can be established between them and their keepers. This fear may cause the female to refuse the attentions of the male; or she may become excited so as to injure herself and give birth prematurely. But worst of all, even after producing a litter of healthy young, she may be so solicitous for their safety as to maltreat or kill them in her efforts to get them out of imaginary harm's way. Often when her young are just born, or only a few days old, she will carry them about the inclosure all day, apparently seeking a place to hide them. Perhaps she digs a hole in the ground and removes them one by one from the warm den to the cold earth. Thus the little things may be moved successively to a number of freshly dug holes and to and from these and the den until they die. From the time the cubs are born until they are two or three weeks old constant care must be taken to prevent losses in this manner. Any unusual sight, sound, or odor, by day or night, is liable to alarm a vixen and cause her to maltreat her young. The best way of dealing with a worried vixen is to shut her with her cubs in the den for several

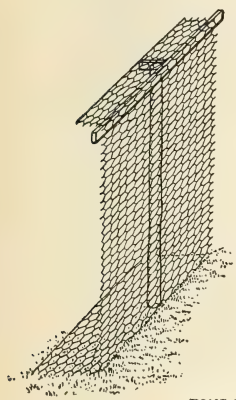

FIG. 18.—Fence turned inward at surface of ground to form a mat.

hours or until she becomes pacified. If she is disturbed by the proximity of other foxes, as sometimes happens, her view should be limited by boarding in the lower 2 or 3 feet of her yard.

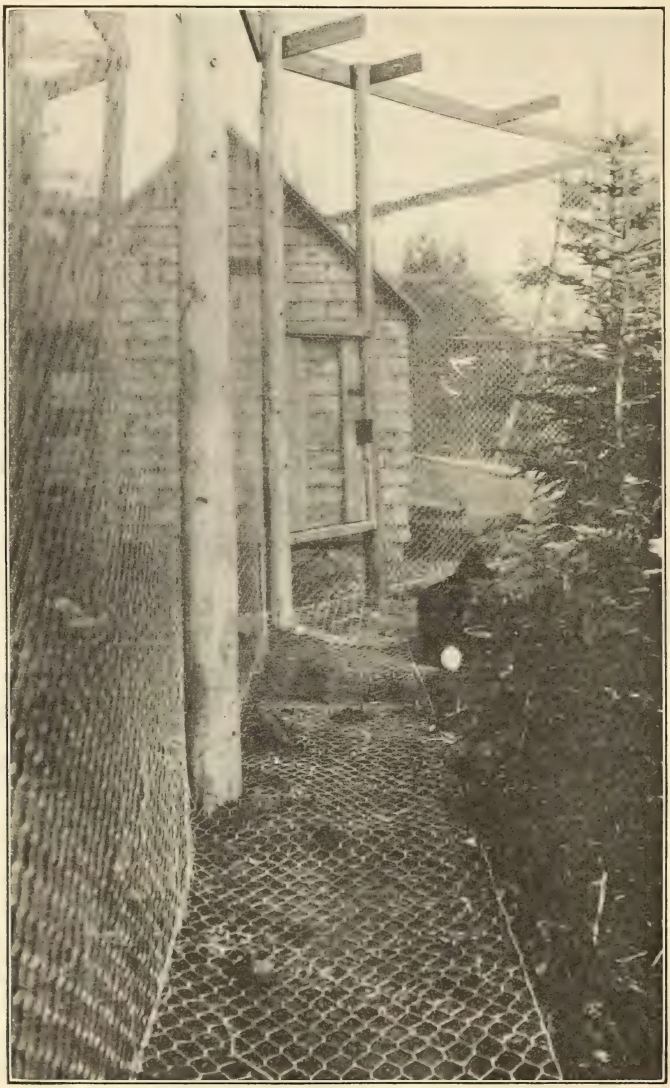

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FIG. 19.—Details of entrance, mat, and overhang of a fox yard.

CARE OF YOUNG.

Young foxes are subject to other troubles which, unless corrected, often prove fatal. They may be infested with external or internal parasites, or their mothers may not have enough milk to nourish

them properly. It is very important that their condition from day to day be known. But the great value of the cubs, and their danger from the irritability of their mothers, generally cause the keeper to refrain from looking into the dens. By watching the behavior of the mothers they judge whether or not the young are doing well. It has been demonstrated by at least one progressive keeper that this uncertainty is by no means necessary. Foxes are not excited by routine events. By giving them large two-room dens, similar to the one shown in figure 9, and always feeding them in the outer compartment, they are led to expect the entrance of the keeper as the regular preliminary to each meal, and even to welcome it. When the keeper enters, they, of course, depart, leaving him free to look into the inner den. He should not touch the cubs unless they need attention.

The young are small and weak at first, and their mother remains with them almost constantly for the first three days. They grow rapidly and usually begin to appear outside the den in about a month. When 6 weeks old they eat more or less solid food. After this they may be weaned. Many breeders leave the weaning entirely to the vixen unless she is becoming emaciated. A decided advantage in weaning cubs when they are 6 or 8 weeks old is that when the keeper controls their food he can more easily eradicate the intestinal worms which usually infest them. Care should be taken to keep early-weaned cubs clean and dry. In case of accident to a mother fox, cubs may be reared by cats almost from birth. Not more than two cubs should be given to one cat. After they are about 3 weeks old their teeth become large and sharp enough to lacerate their foster mothers, and they must be reared by hand.

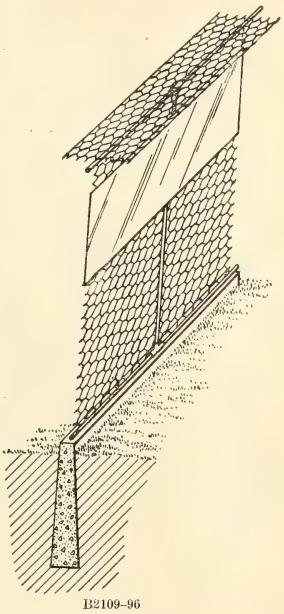

FIG. 20.—Section of a fence containing a smooth zone to protect foxes from injury by falling. Concrete foundation and iron posts.

BEHAVIOR IN CAPTIVITY.

Aside from propagation, the domestication of foxes has proved simple. It is true that they rarely become very tame. Even after several generations of parents reared in captivity the offspring retain the wildness characteristic of the species. Nevertheless they are amenable to gentleness. They quickly learn to recognize their keeper and to come to the feeding place when called. Most of them can be induced to take food from the hand, but their tempers are uncertain.

Instinctively timid and distrustful, unlike dogs, they do not seem capable of becoming attached to the person in charge of them. The approach of a stranger makes them uneasy and usually drives them into their dens, but ordinary travel along a thoroughfare a hundred yards or more away gives them no apparent concern. All moving objects interest them keenly. Birds alighting within their yards often fall prey to their agility. If well fed they seldom fight, and when they do, fatalities rarely result. In a few cases two or more have turned upon another and killed or badly crippled it, but usually this has been due to underfeeding or to improper handling during the mating season. When believing themselves unobserved, they play together or lie contentedly stretched at length in the sun.

Cold weather has no terrors for foxes, and snow is a delight. At times of alternate freezing and thawing they should not be allowed to lie down on snow as they may thus seriously injure their coats. They rarely make determined efforts to escape from inclosures except during the first few days of captivity. Then they dig for perhaps a foot at the extreme edge of the inclosure where the wire enters the ground, but if the wire is merely turned in at the bottom (fig. 18) they dig only in the angle, and obviously can not accomplish much, as they must work by thrusting their paws through the meshes. If stones are placed along the edge of the wire, foxes make no effort to dig out, as tunneling under seems never to occur to them. The overhang at the top of the fence ordinarily prevents escape in that direction, but an unusually heavy fall of snow sometimes enables foxes to reach an elevation from which they can leap upon the overhang and scramble out. In several cases, however, they have returned to the inclosures and climbed back or have been caught in traps set for them near by. When at large, foxes do not often climb trees, but in captivity they do so readily, often lying for hours curled up in the thick branches of a spruce or fir.

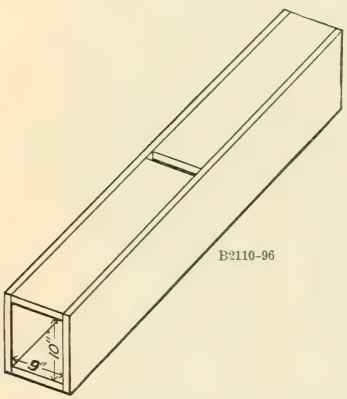

FIG. 21.—Chute for connecting yards. It can be closed by inserting a sliding door in the slot.

HANDLING FOXES.

Unless foxes are diseased or injured, it is rarely necessary to lay hands on them. When one is to be removed from its yard, ordinarily it can be first driven into its den and thence into a small handling box having a sliding door at one end and strong wire netting covering one side. In this manner it can be transferred without

danger of injury to itself or its keeper. It is best to darken the handling box by covering it or by turning the netted side downward on the ground before attempting to drive a fox into it. In actually handling grown foxes it is prudent to wear gloves to guard against being bitten, though this precaution is not always adopted by experienced keepers who understand just how to handle them. An effective device for catching foxes is a pair of tongs with jaws curved to form a circle $2\frac{1}{2}$ inches in diameter. The fox is first driven into its den or into a large covered box. Then the cover is raised barely enough to let the tongs pass in and grasp the fox around the neck. By holding the tongs in one hand and grasping the hind feet and tail of the fox with the other, the animal can be held securely.

Healthy foxes if properly boxed and cared for can be shipped safely almost any distance. Two foxes or even more than two are sometimes shipped in the same compartment, but this is inadvisable unless the distance is short. As a rule, a box containing two should be partitioned, each animal having a space equivalent to 2 by 3 feet on the floor and $1\frac{1}{2}$ feet high. About half of one side of the box should be removed and the opening covered with wire netting to allow ventilation and inspection. Shippers often cover the entire box with netting or tin to preclude the possibility of escape. A dish for water should be fastened to the floor close to the front, where it can easily be filled. Foxes are not usually injured by a fast of three or four days but they should not be allowed to suffer from thirst. Express companies, if duly instructed, will feed animals en route and add the cost to the regular transportation charge. In case the animals are very valuable or are to be shipped a long distance, an attendant should accompany them.

SANITATION.

Generally speaking, sickness is not common among domesticated foxes that are well cared for. Once in a while one breaks a leg as the result of a fall or, more often, from entanglement in wire netting having too coarse meshes. Lacerations rarely result twice from the same cause or from fighting. Even more rarely a fox is choked while eating. Passing meat and small or soft bones and cartilege through a bone grinder will not only prevent choking, but allow enough bone to be fed with the meat to produce sturdy animals. Simple fractures, uncomplicated by abrasions, will mend if untouched, but it is better to bind splints upon the wounded limb to keep it in proper shape, and then to apply iodoform to prevent the animal from tearing them off. When a bone is badly shattered, and especially when it protrudes, the leg should be amputated. Anesthetics are likely to kill foxes and hence should not be used. Flesh wounds ordinarily require no attention other than washing once or twice a day in warm

carbolated water or with castile soap, followed by an application of hydrogen peroxide.

Thus far no widespread disease among foxes has made its appearance. When diseases occur they mainly affect the digestive organs, and usually can be traced to improper feeding. Indigestion and inflammation of the bowels are not uncommon among cubs. Isolation in clean, dry quarters is the first step toward a cure, and rest and fasting are better than medicine. A spoonful of milk diluted with six spoonfuls of boiled water will quench thirst and aid in maintaining strength. The feces should be examined daily. Constipation is frequent, and it is especially dangerous to vixens during the first three days after the birth of their cubs. It can generally be corrected by a laxative diet, as milk, liver, or veal, but in extreme cases a dose of castor oil or an injection of soapsuds may be necessary. A protracted attack of diarrhea can usually be checked by a purge of castor oil followed by small doses of laudanum. Generally, however, a day or two of fasting followed by short rations of cooked milk or milk and eggs, at intervals of two or three hours, will effect a cure. During such an attack vitality runs low, and care must be taken to keep the afflicted animal in a warm, dry place. It should have access to water that has been boiled. Growing cubs are frequently subject to weakened and distorted legs. This disease, known as rickets, can be prevented by including ground bone in their meat rations and by adding limewater to their milk. The bones of calves and those from the briskets of beeves are comparatively easy to crush so that foxes can swallow them.

At quarantine stations, where imported animals are examined, particular attention is directed to symptoms of rabies and mange. The fact that rabies, or hydrophobia, is communicable to man makes it doubly dreaded. Fortunately it has not appeared among domesticated foxes so far as known. Mange is characterized by a loss of fur. It is caused by a tiny parasite, somewhat like the itch mite, and is, therefore, very contagious. Were it to obtain a foothold among domesticated foxes, it would seriously hamper and perhaps ruin this branch of the fur industry. All animals showing a tendency to have bare spots should be isolated at once. The diseased parts should be treated daily with ointments, as petrolatum or a mixture of lard and sulphur.

Foxes serve as hosts for a number of other parasites. Lice and fleas infest their hair and skin, while roundworms and tapeworms drain their vitality from within. The death of a fox has occasionally been attributed to lice. Even if not fatal, lice and fleas diminish the vigor of their hosts and should be persistently combated. Some fox breeders dip all their animals in a solution of creolin or a similar nonpoisonous dip shortly after the cubs are weaned. It is well in

any case to dust the dens with sulphur and insect powder at frequent intervals.

The intestinal worms infesting foxes are difficult to eradicate. Probably more young foxes succumb to the effects of roundworms than to any other cause. These worms are whitish, cylindrical creatures, tapering toward either extremity. Among the symptoms indicating their presence are dullness, barking, frothing at the mouth, dragging the body by the fore legs, and convulsions. The flat, jointed tapeworm, often a foot or more in length, is a less fatal as well as a less common internal parasite, but animals suffering from them are emaciated and lack overfur or guard hairs. As a cure for worms one breeder of long experience frequently gives his cubs a meal of crushed flaxseed and milk, alternating now and then with six or eight drops of spirits of turpentine in milk. Another doses his cubs every fortnight after they are four weeks old with a proprietary vermifuge put up in gelatine capsules for puppies and pet dogs, beginning with half of the contents of one capsule. Castor oil containing a few drops of turpentine is also recommended. Any remedy administered by hand must be pushed down below the base of the tongue, when it will be involuntarily swallowed.

A fox sometimes dies from no assignable cause. More often fatalities can be traced to a lack of care or foresight. The dishes from which the animals eat and drink should be washed daily and scalded frequently. The water should be clean and changed daily. The food should be varied and wholesome. Danger from unwholesome food is well illustrated in the experience of one ranchman who lost several of his choice breeders through feeding them spoiled fish; and another who lost $100,000 worth of cubs as a result of thoughtlessly exposing meat overnight to the fumes of gasoline in his slaughterhouse. The appearance of each animal should be critically noted every day. On many of the larger ranches a doctor is regularly employed to look after the health of the stock. In the care of foxes an ounce of prevention is worth a pound of cure.

IMPROVED STRAINS.

The fact that domestic animals originated from wild stock and that improved strains have from time to time been secured makes it reasonable to assume that other wild animals can be differentiated and improved by the same method, namely, selective breeding. So far as foxes are concerned, this has already been done. The pioneer fox breeders began with ordinary silvers, which have a tendency to produce red as well as silver progeny. At that time dark pelts were more valuable than light-colored ones. By regularly disposing of the less desirable cubs and breeding only from the best, the tendency to throw red was soon eliminated, and the color of the

fur greatly improved. Within 16 years from the time the two pioneer fox-breeders built their ranch, they were sending to market the finest fox pelts in the world.

The tendency of wild silvers to produce red progeny is accounted for by the fact that owing to their scarcity probably only one in a hundred can have a silver mate; perhaps three in a hundred may mate with cross foxes, which are merely hybrids, or descendants from hybrids, between silvers and reds; and the remaining ninety-six must mate with reds. In any event, although some of the cubs may be silver, all of them will inherit from their red ancestors a tendency to throw red. As has already been pointed out, however, this tendency very soon disappears under the influence of careful breeding. Generally speaking, pure strains of silver foxes breed true. So also do pure strains of red. When a red and silver are mated together, the color of the progeny can not be foretold. The cubs may be red with black throats, or they may be crosses, or a mixture of the two. One or more may be silver, but this is unusual. Random breeding from silvers and crosses of unknown pedigree is equally uncertain, as is shown by the following results:

A silver mated with a red produced two crosses, which when mated together produced one red and four silvers. A silver and a cross produced three silvers and two reds. A cross and a red produced two crosses and two reds. A cross and a cross produced two silvers, two crosses, and one red. Another pair of crosses produced nine crosses. A red of silver-cross parentage mated with a red of silver parentage produced one silver and two crosses. A silver and a red produced in two successive years thirteen silvers. A pair of reds from the same litter as two silvers produced three silvers, one cross, and two reds. A pair of silvers produced one silver and five reds, two of which, when mated together, produced three silvers and one red the first year and two silvers the next year. Another pair of silvers produced four crosses; while a silver and a cross produced a litter of all silvers.

These results indicate the uncertainty of breeding at random, but they show also that if a fox of any color whatever has in his veins silver blood, the silver can be made to appear in succeeding generations by selective breeding. This fact is most important. Suppose a breeder has a strain of silvers lacking in size, or fecundity, or in some other desirable particular. He can introduce specimens having the desired qualities without having to consider color. A red fox can be used if one of better color is not available. In the course of three or four generations the silver can be fully reinstated. Among the features to be considered besides color are size, fineness of fur, fecundity, docility, and hardiness. Fecundity appears to be a

hereditary trait among foxes, daughters of prolific mothers being themselves generally prolific. How rapidly other desirable characters can be incorporated remains to be determined. As with poultry, horses, and other farm animals, so is it with foxes. Each breeder should strive to perfect his animals according to some standard. Eventually there may be several standards based upon varied uses or requirements.

The process of developing improved strains can undoubtedly be shortened by taking advantage of local variations in foxes. One of the lines of investigation conducted by the Biological Survey includes the geographic variations of North American mammals, and from this it is possible to say not only where silvers and crosses occur most frequently, but where the largest and the best-furred foxes are found. Upward of 20 species or subspecies of red foxes have been named in the United States and Canada. The medium-sized foxes along the North Atlantic coast are notable for their fine silky hair. The largest foxes are in Alaska and on the Plains northward from Minnesota and North Dakota. The large size of Alaskan coast foxes is offset by long, coarse pelage, which is decidedly longer on the shoulders and back of the neck than on the back and hips. It remains to be seen whether in crossing them with the smaller, finer-haired animals the progeny will be large or small, coarse-haired or fine, or intermediates. There can be little doubt, however, that in the long run such a cross will result in larger fine-haired foxes than any now existing. The northern part of the red fox's range has, as a rule, a larger proportion of silvers than has the southern. An exception is found in the Cascade Mountains in Washington, Oregon, and California, where, judging from specimens in the National Museum, the percentage of melanistic specimens is very large. They have little to recommend them besides color, however, as they are small and have rather coarse fur.

Black and silver foxes are found in North America practically throughout the range of the red fox. The best-furred animals do not occur, however, throughout this range, but are obtained mainly in restricted areas. For instance, skins from the Tanana River district in Alaska and the adjacent part of Yukon Territory, from certain other parts of northern Canada, and from the North Atlantic coast from Maine to Labrador, including Prince Edward and other islands, are of about the same grade. This is recognized by the leading London furriers, who report that "in our opinion, fox skins from Labrador, Newfoundland, or Alaska are equal in quality to those from Prince Edward Island."

It is not known that any particular geographic race of foxes is especially characterized by fecundity or docility. These qualities

are probably individual, occurring in about the same proportion everywhere, and while of secondary importance, in the long run they are sure to be favorable to success in fox farming. Already prolific pairs bring much higher prices than those which have thrown small litters or have not been tested. Inasmuch as one of the main causes of loss among young cubs is the timidity and nervousness of vixens, the development of more docile strains will result in corresponding increase in the birth rate. Some male foxes are much better mates and sires than others. In selecting breeders the temperament of males as well as of vixens should be considered. The physical development and potency of males are also essential factors. Young males that are not strong, or not well developed when six months old are not likely to be of use in the breeding yards the first year, and should not be selected for sires.

Food is recognized as a very important element in the development of good animals. The finest specimens of domestic cattle are those which have been fed most wisely. As regards foxes, much remains to be learned concerning the effects of different rations upon such matters as potency, character of fur, and rate and limits of growth. It should be a part of every breeder's plan to discover what he can about the relative values of foods and methods of handling as influencing the process of selective breeding. Ultimate success or failure in fox farming depends largely upon the aspirations of those engaged in it. If breeders earnestly, consistently, and indefatigably endeavor to improve their stock and to produce pelts that are larger, softer, and more uniformly colored than the usual run, there can be no question as to the result. There will never come a time when an extra fine silver fox pelt will not command a good price, or when a breed producing such pelts will not be in demand.

ACCESSORIES.

Contentment and vigor of the animals within a ranch is of the utmost importance. Whatever contributes toward increasing these qualities should be incorporated if possible. It is well to test young foxes with such toys as a ball, a tin can, or a piece of woolen cloth, with a view to amusing them and exciting a spirit of playfulness. A variety of objects in which they can hide and upon which they can mount for a survey of their surroundings, as hollow logs, stumps, brush piles, or open barrels, is desirable.

While the suggestions given under this heading apply primarily to those having large capital invested in fox farming, they will also be found helpful to those operating on a small scale. The present value of silver foxes is so great that every precaution is taken to prevent accidents, sickness, or other misfortunes. Watchmen are kept on

guard day and night. The keeper's lodge is just outside the guard fence. In addition there is sometimes a tower, from the top of which a view can be had of all the yards. Here are recorded the progress of events in the breeding season; and from here quarrels, accidents, or signs of sickness can be discovered without alarming the animals. A tower 12 or 15 feet square and three stories high, fitted up as a 3-room house, would contain on the top floor the watchman's couch, chair, and field glasses, his table and writing materials; a cook stove, pantry, sink, and other kitchen appurtenances will be on the ground floor, and here food for the foxes can be conveniently prepared. Somewhere about the place there will be a medicine chest and various tools likely to be needed in an emergency.

Risk of loss by theft or escape is lessened by installing electric lights which can be turned on at any time, and an electric burglar alarm. Bulldogs are used to reenforce the night watchman; and on some ranches bloodhounds are kept for tracking thieves. Foxes that escape generally return to the vicinity of the ranch when hungry, and a number of small steel traps having the jaws wound with cloth should be kept on hand to catch them. Ranch foxes have less endurance than wild ones, and a good hound can usually overtake one after a short run. The manager of a ranch on Prince Edward Island has a hound which on several occasions has assisted in the capture of foxes without hurting them in the least. Such dogs are excellent insurance against loss by escape.

Other accessories of a fox ranch, and those most prominent, pertain to food supplies. There must be facilities for slaughtering horses, cattle, and smaller animals; an ice house and a refrigerator for keeping the meat fresh until it can be used; and conveniences for drying, smoking, and salting meat that must be kept a long time. A screened room or box is necessary to protect stored meat from flies. Cows are needed to furnish milk, an important element in the diet of domestic foxes. In a dairy region calves are disposed of when but 2 or 3 days old. At that age they are small, and their flesh is soft. Sometimes there are more of them on hand than can be used immediately. By having cows to suckle them a few weeks, the veal, improved in quality and increased in quantity, will be available when needed. Rabbits are the natural prey of wild foxes. They have an important place on a fox ranch as a fox food which can be drawn upon at any time, which is always fresh, and in such small units that ice or other preservatives are unnecessary.

Occasionally a vixen having young cubs is unable to give them proper attention. Then a foster parent must be supplied at once or the cubs will die. To provide for emergencies of this kind, every ranch should include several female cats.

COSTS.

The cost of establishing a fox ranch varies according to the materials used, transportation facilities, and the proportion of labor performed by the owner. The factory price of the netting described in the section relating to inclosures is from 1 to 2 cents a square foot, according to the mesh and size of wire, when sold in rolls containing 150 linear feet. It is manufactured in the various widths required for different parts of the fences. The cost of netting for a 2-pair ranch would thus be about $225. The posts, sawed lumber, and miscellaneous hardware to complete the ranch might cost $100. Ordinarily in a fur country the expense for lumber would not be great. A considerable saving can sometimes be made by building the guard fence of boards instead of netting. The average life of the netting is about 12 years, except when exposed to sea air, in which case it is only about 8 or 10 years.

Feeding a fox costs from $5 to $15 a year. On a farm where there are cows and where grain and vegetables can be raised it is not necessary to buy very much fox food. Except on large ranches devoted exclusively to fox raising and where a special keeper must be employed, the care of a few foxes will not entail much outlay.

The present demand for silver foxes and their relative scarcity place them, as stock, beyond reach of the ordinary purse. In determining a reasonable price for a breeding pair, there must be taken into consideration the value of the skins they may be expected to produce, the cost of annual maintenance, the probable deterioration of stock, possibility of loss through death or otherwise, and the question of reasonable profit from the young produced. There is a tendency to overestimate the value of fox skins which is well exemplified by the following: The average minimum value of a pelt, as estimated for 133 silver fox skins of all grades offered in June, 1914, at a London auction sale was about $150, although at the sales they realized an average of only $118 each. The fixed annual charges against a pair of silver foxes will vary with the locality and value of equipment, etc. On some ranches it has been estimated about as follows: Interest on cost of yards, $10; depreciation of yards, $10; food, $20; and attendance, $50; amounting to $90; added to this must be a reasonable charge for interest on the original cost of the pair. Killing foxes at the age of 4 or 5 years, when their pelts are good, and breeding always from young stock may be practicable, but this point has not yet been decided. As a rule, one may expect to keep choice animals as long as they are productive; that is, about 10 years. Deterioration, therefore, on the live stock will be 10 per cent; and to this should be added 10 per cent for insurance against loss by death, escape, or theft. Prolific animals belonging to choice strains, in which a superior color and quality of fur have been fixed, are worth

for breeding purposes as much more than ordinary stock as thoroughbred horses are worth more than common horses, probably tenfold.

As has been pointed out under the subject of improved strains, crosses and reds derived from silvers throw a proportion of silver cubs. It is feasible, therefore, if one is willing to sacrifice the time required, to obtain a stock of silvers from these more common foxes, which cost comparatively little.

PROFITS.

The profits of silver-fox farming have hitherto been large. Prior to 1910 they were realized mainly from the sale of pelts. Since then they have been derived almost entirely from the sale of live foxes for breeding purposes. Values went up rapidly and profits multiplied accordingly.

The recent sharp decline in prices for breeding stock is quite certain to result in heavy loss to those who have paid dearly for a poor grade of animals, especially if they have not sufficient means to tide over the changing conditions.

The supply of silver fox pelts must always come from cold climates beyond the more thickly settled temperate regions. They are not likely, therefore, to become overabundant. Red fox skins have been coming to market for many years. Their numbers, while fluctuating considerably from year to year, have, on the whole, remained approximately constant. Their average value, however, has increased. This indicates a steady demand which may be expected to keep pace with the increase of population and wealth. But the supply from wild foxes can never be greater than it is now. Already red foxes can be raised and their pelts sold without loss, and it is altogether probable that before many years the rise in fur values and the introduction of more economical methods of ranching will result in making the raising of red foxes profitable. The superior beauty of silvers should always make them worth several times as much as reds, and many years must pass before they can become common.

PREPARATION OF SKINS.

The preparation of skins requires no special implements or preservatives. Extreme care must be taken to prevent blood from coming in contact with the fur. With this in view, the method of killing commonly adopted is to lay the fox on its side on clean snow, and then to compress its chest by standing upon it. This stops the action of the heart and lungs and death follows immediately. The same result, without the unpleasant features connected with thus catching and smothering the animal, can be obtained by means of a killing box which, from a humanitarian point of view, is preferable. This is merely a tight wooden box into which the fox is to

be driven from its den. When the fox is inside and the door securely closed, an ounce or two of chloroform or carbon bisulphide is poured through a hole in one of the upper corners into a wide, shallow dish, as a tin pie plate, fixed just below in such a manner that the fox can neither get into it nor upset it. The hole through which the pouring is done should be corked at once and every part of the box made practically air-tight. The smaller and tighter the compartment the less will be the quantity of anesthetic required. The box should not be opened within half an hour.

In removing a fox's pelt a slit is made in the skin with a sharp-pointed knife, beginning on the bottom of one hind foot and extending up the back of the leg to the vent and thence down the other hind leg to the foot. The entire body is removed through this opening, using the knife to separate the skin when necessary, and proceeding down over the head to the lips, where the final cuts are made. The tail bone must be carefully withdrawn, preferably by using as a vise two firmly held sticks (or a split stick), through which the bone is passed. To facilitate this it is usually desirable

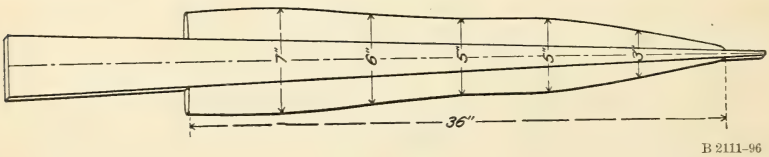

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FIG. 22.—Diagram for stretching board for casing skins. The wedge makes it adjustable in width and facilitates removal from a skin.

to slit the tail on the underside. Thus the skin is turned completely inside out. It is then carefully fleshed—that is, all the fat and bits of flesh adhering to it are removed.

To dry the skin, it is first drawn, flesh side out, over a stretching board, like the one illustrated by figure 22, and hung by the nose in a cool, dry place. Within a day or two, while the legs are still pliable enough to be turned, the board is withdrawn and the pelt reversed, after which the drying is continued. Pelts should not be exposed to sunshine, as it fades them and, through its action on fat, makes them brittle.

LEGAL ASPECTS.

Popular opinion regarding the economic importance of wild foxes varies in different regions. As a rule they are unmentioned in game laws. In Rhode Island, where poultry raising is a prominent industry, foxes are considered a nuisance and a bounty of $3 each is offered for their scalps. Connecticut has recently repealed a similar law. In certain localities in the Middle Atlantic States the animals are esteemed for the sport they afford in the chase, and on this account

are protected from trapping at all times and from any molestation during an annual close season.

In several of the States in which fox farming is or may be carried on, foxes are protected to some extent on account of their fur value. Here, unless provision is made to distinguish between wild and domestic animals, owners of fox ranches will be more or less hampered by game laws. These States are New Hampshire, Vermont, Delaware, Tennessee, Ohio, Michigan, and Missouri. Young foxes are sometimes secured by digging them out of their burrows after they are large enough to be raised. This method is more humane than using the steel trap, and, furthermore, is desirable because young animals tame more readily than adults. It can not legally be employed, however, where there is a close season for foxes unless the law provides for propagating purposes. Such a provision has been made by the Department of Commerce in its regulations to govern the taking of fur animals in Alaska, where, although foxes may not be disturbed during the breeding season, they may be taken alive for propagating purposes between July 1 and March 15 next following. Before one can engage in fur farming in Alaska a license must be secured from the Department of Commerce, Washington, D. C., and all shipments of fur out of the Territory must be reported to that department. The possession and barter of unprime skins is prohibited.

In this connection the availability of Alaskan islands for fur farming and the regulations governing their use may be considered. While many of these islands are suitable for raising blue foxes, it is doubtful if any are well adapted for silver foxes. At all events, the red fox native to the coast side of the mountains in Alaska, although large, has inferior fur. The Aleutian Islands are undoubtedly not suitable for silver fox breeding. The necessity for segregating silver foxes by fences, singly or in pairs, takes away the chief advantage which an insular location was formerly supposed to offer. The uncertainties of food and transportation are additional insular disadvantages. On the other hand, islands are usually free from outside disturbances, and for this reason, perhaps more than any other, inquiries are occasionally received as to how they may be occupied. The islands off the mainland and peninsula of Alaska, excepting those in national forests, are under the jurisdiction of the Secretary of Commerce, who, at intervals, advertises to lease to the highest responsible bidders the exclusive right to propagate foxes and other fur-bearing animals on certain specified islands. Only American citizens, or companies, or corporations organized under the laws of a State or Territory are permitted to lease or occupy them. Each lessee must make sworn annual reports, containing details of all such facts and operations as may be required, on blank forms furnished

by the Department of Commerce.[1] The Aleutian Islands and islands included in national forests are under the jurisdiction of the Secretary of Agriculture.

Game laws and regulations are notoriously subject to change. Each legislature and each new régime modifies them more or less. Those outlined above are likely to be modified or displaced altogether within a few years. Therefore, until domestic foxes attain the status of other domestic animals and are freed from the application of game laws, persons intending to breed or deal in them should first inform themselves as to the bearing of current laws upon the proposed enterprise.

SUMMARY.

The silver fox is a color phase of the common red fox. The beauty and rarity of its pelt have made it the most valuable of fur animals. It was first successfully domesticated in 1894 in the Canadian Province of Prince Edward Island. In 1910 pelts from ranch-bred foxes brought higher prices than those from wild foxes, the average value being over $1,300 each. Since that time the demand for breeding stock has been so great that very few domesticated foxes have been slaughtered. Prices of live foxes soared beyond reach of the ordinary purse, but they have declined heavily since the beginning of the European war. Stock companies, some of them very much overcapitalized, have been organized to engage in the new industry, which thus has suddenly been transformed from a secret enterprise into a widely heralded speculation. One of the favorable results of this expansion has been a careful study of foxes in domestication, and this will contribute materially to the permanence of fox farming.

A fox ranch should be situated where it will have good drainage and be partially shaded by a young growth of deciduous trees. Each pair of foxes should have a runway of about 2,500 square feet. They thrive on a varied diet, including meat, fish, bread, mush, milk, and table scraps. The reproductive period is about 10 years. The young are born in April or May, the average litter containing four cubs; but as only about half of the captive females produce young in any given year, the annual increase has not averaged above 100 per cent.

Foxes bear captivity well. No widespread disease has appeared among them. Wounds heal readily, and cases of sickness are usually attributable to a lack of proper care. By selective breeding the originators of fox culture produced a superior strain of animals in the course of a few years. This fact is an assurance that even greater improvements can be achieved by selecting, from different geographic races, foxes of the largest size and crossing them with animals having the finest fur.

[1] Full information regarding leasing Alaskan islands may be had by addressing the Secretary of Commerce, Washington, D. C.

The exceedingly high value of silver foxes has led to the adoption of a variety of precautions against their loss. On the more pretentious ranches the animals are regularly examined by a doctor and guarded by watchmen, bulldogs, and burglar alarms. Cats are kept to act as foster mothers to orphan cubs. Foxhounds are trained to overtake and hold without injury foxes that have escaped, and bloodhounds are employed to track thieves.

The cost of yards runs from $100 to $150 each, and that of foxes from $150 to $250 for common silver foxes up to several thousand dollars for the best silvers. The price of foxes will decline as the supply increases. The profits from breeding silver foxes have thus far been very large. So long as the demand for breeding-stock exceeds the supply, the value of the annual increase, or the gross income, will average approximately 100 per cent of the value of the breeding stock. When part of the increase can be disposed of only by slaughtering for fur, profits will be less than at present, but even then they are likely to be much greater than from ordinary lines of husbandry involving like capital and attention.

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